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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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23908	7590	04/20/2005	EXAMINER	
RENNER OTTO BOISSELLE & SKLAR, LLP			VAN ROY, TOD THOMAS	
1621 EUCLID AVENUE			ART UNIT	
NINETEENTH FLOOR			PAPER NUMBER	
CLEVELAND, OH 44115			2828	

DATE MAILED: 04/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	<b>Application No.</b> 10/619,947	<b>Applicant(s)</b> NILSSON ET AL.	
	<b>Examiner</b> Tod T. Van Roy	<b>Art Unit</b> 2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-34 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-34 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 July 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. ____.  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>07/15/2003</u> 12   1   03  | 6) <input type="checkbox"/> Other: ____.                                    |

## **DETAILED ACTION**

### ***Drawings***

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: Fig.5 #1501,1502,1401,1402,1403,1407,2803,1710,2800 and Fig.8 #1401,1501. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

***Claim Objections***

Claim 30 objected to because of the following informalities: No period is found at the end of the claim statement. Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 16, 22-25 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

With respect to claim 16, the applicant did not provide examples or a concise explanation of the claimed material, namely what is meant by an absorber and what function it would perform, therefor it would take undue experimentation for one skilled in the art to make or use the proposed invention.

Claims 22-25 are believed to be inherent and are hence rejected to below, if not inherent, claims 22-25 are not found to be enabled. The applicant did not provide examples or a concise explanation of the claimed material, namely what materials and or system would provide or enhance said first and second inelastic scattering events,

Art Unit: 2828

therefor it would take undue experimentation for one skilled in the art to make or use the proposed invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 15, 23 and 24 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 15, the phrase "for example" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. See MPEP § 2173.05(d). The examiner has taken the range to be a limit of the claim.

Claims 23 and 24 recite the limitation "the first and second inelastic scattering events" in the first line of each of the claims. There is insufficient antecedent basis for this limitation in the claim.

Claims 23 and 24 have been examined as if dependent on claim 22 which would provide antecedent basis.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

Art Unit: 2828

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 6, 7, 10, 11, 13, 16-19, 27, 31, 32, and 34 rejected under 35

U.S.C. 102(b) as being anticipated by Waarts et al. (US 6081369).

With respect to claim 1, Waarts discloses a waveguide device (fig. 1a) comprising a pump source (fig. 1a #Ps) operable to generate a pulsed pump beam (col.7 lines 29-34) pulsed at a pump frequency and having a pump wavelength, and an optical waveguide structure (fig. 1a #10) comprising a signal waveguide (col. 3 line 60, core) and a pump waveguide (col.3 lines 64-65, inner cladding) wherein the optical waveguide structure is arranged to receive the pulsed pump beam into the pump waveguide (col.3 lines 64-65) and wherein the signal waveguide contains a gain medium (col.3 lines 61-62) that is responsive to the pump wavelength to provide instantaneous or near instantaneous gain at a signal wavelength offset from the pump wavelength and thereby generate a signal beam that amplifies by drawing energy from the pump beam (col. 4 lines 21-28, 45-55).

With respect to claims 6 and 7, Waarts discloses the waveguide device as described in the rejection to claim 1, and further discloses the optical waveguide to include an optical fiber (col.3 lines 57-61, and col.6 lines 66 - col.7 line 4).

With respect to claim 10, Waarts discloses the waveguide device as described in the rejection to claim 1, and further discloses the instantaneous or near instantaneous gain to be generated by stimulated emission (abs. lines 5-8) from an energy band populated by the pump beam (col.6 lines 59-62).

With respect to claim 11, Waarts discloses the waveguide device as described in the rejection to claim 1, and further discloses the structure to be doped with rare earth elements (col.3 lines 61-62).

With respect to claim 13, Waarts discloses the waveguide device as described in the rejection to claim 1, and further discloses the pump source to be an optical fiber laser (col.4 lines 17-19).

With respect to claim 17, Waarts discloses the waveguide device as described in the rejection to claim 1, and further discloses a seed source for providing a seed beam at the signal wavelength (fig.1a #1s), wherein the optical structure is arranged to receive the seed beam from the seed source into the signal waveguide.

With respect to claims 18 and 19, Waarts discloses the waveguide device as described in the rejection to claim 1, and further discloses the optical structure to be configured so that at least a portion of the signal beam is fed back to provide a seed beam at the signal wavelength (fig.13, using reflective element #134).

With respect to claim 27, Waarts discloses the waveguide device as described in the rejection to claim 1, and further discloses the structure to be predominantly made of silica (col.6 lines 64-65).

With respect to claim 31, Waarts discloses the waveguide device as described in the rejection to claim 1, and further discloses the pump beam to be multimode (col.19 lines 45-48).

With respect to claims 32 and 34, Waarts discloses the waveguide device as described in the rejection to claims 1 and 10 above, while claims 32 and 34 are

Art Unit: 2828

methods of generating the stated signal beam and are hence rejected for the same reasons.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Waarts in view of Fermann et al. (US 5818630).

With respect to claim 2, Waarts teaches the waveguide device as described in the rejection to claim 1, and further teaches the pump pulse length to be 400 usec (col.7 lines 41-44) corresponding to a distance of 120km. Waarts does not teach the optical waveguide structure length to be less than that of the pump pulse. Fermann '630 teaches the use of an optical waveguide structure to be 1.5m (col.10 lines 63-67) corresponding to a pulse length of 300 nsec. It would have been obvious to one of



Art Unit: 2828

ordinary skill at the time of the invention to combine the waveguide and pulse length of Waarts with the optical structure length of Fermann '630 to achieve high peak powers and non-appreciable non-linear effects.

Claims 3, 4, 5, 12, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Waarts.

With respect to claim 3, Waarts teaches the waveguide device as described in the rejection to claim 1, and further teaches the signal source to be configurable to match a round trip frequency of the optical waveguide structure (col.7 line 63 – col.8 line 27, emphasis on col.8 lines 9-10, 22-27). Waarts does not teach the pump source to be configurable to match a round trip frequency of the optical waveguide structure. It would have been obvious to one of ordinary skill at the time of the invention to combine the signal modulation techniques with that of the pump source in order to control pulse shaping and induce mode locking in the cavity.

With respect to claims 4 and 5, Waarts teaches the pulse length to be configurable to match a round trip frequency of the optical waveguide structure, where the maximum pulse width was given as 400 usec (col.7 lines 41-44), as outlined in the rejection to claim 3 above. The pump pulse is hence adjustable to widths smaller than the optical waveguide structure down to physical limits of the light emitting material, and is capable of matching motion of the traveling gain field to provide synchronous pumping.

With respect to claims 12 and 14, Waarts teaches the waveguide device as described in the rejection to claim 1, and further teaches the signal source to be Q-switched (col.8 lines 16-27) and the pump source to be a fiber laser (col.4 lines 17-19). Waarts does not teach the pump source to be Q-switched. It would have been obvious to one of ordinary skill at the time of the invention to combine the Q-switching techniques of the signal source with that of the fiber laser pump source in order to control pulse shaping and produce sub-picosecond pulses.

Claims 8 and 21-26, 28, 29 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Waarts in view of Foursa (US 6717963).

With respect to claims 8, and 22-25, Waarts teaches the waveguide device as described in the rejection to claim 1. Waarts does not teach the gain medium to generated by stimulated Raman scattering. Foursa teaches a waveguide structure wherein the gain is generated by Raman scattering (fig.5). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the waveguide device of Waarts with the Raman gain medium of Foursa to provide for a broad bandwidth gain curve (Foursa, col.1 lines 35-40). Claims 21-25 and 29 are processes inherent to Raman scattering, where Raman scattering is know to be an inelastic scattering event. In order for a medium to function as a waveguide utilizing this scattering it is inherent that the pump wavelength be offset from the seed by the amount of the scattering event. It is also inherent that first and second scattering events will have both common and uncommon energies as the waveguide is made of more than

Art Unit: 2828

one material type leading to the chance that the second scatter could arise from a like molecule generating a like energy or one of a different type generating a different energy.

With respect to claim 26, Waarts teaches the waveguide device as described in the rejection to claim 1. Waarts does not teach the length of the gain medium to be suitable for generating higher order Stokes components. Foursa teaches the generation of higher order Stokes components by use of fiber spans of 20-30km (col.4 lines 44-46). It would have been obvious to one of ordinary skill at the time of the invention to combine the waveguide device of Waarts with the higher order Stokes inducing fiber span of Foursa to properly downshift the pump frequency to correctly match with the chosen signal wavelength.

With respect to claim 28, Waarts teaches the waveguide device as described in the rejection to claim 1. Waarts does not teach a cavity to be formed around the optical waveguide to form a laser. Foursa teaches a cavity to be formed around an optical waveguide to form a laser (col.4 lines 35-39). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the optical waveguide structure of Waarts with the laser cavity of Foursa to provide feedback and further amplification of the desired signal wavelength.

With respect to claim 33, Waarts and Foursa teach the waveguide device as described in the rejection to claim 8 above, while claim 33 is a method of generating the stated signal beam using Raman scattering as the gain material and is hence rejected for the same reasons.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Waarts in view of Foursa, and further in view of Libori et al. (USPGPUB 2005/0069269).

With respect to claim 9, Waarts and Foursa teach the optical waveguide as described in the rejection to claim 8 above. Waarts and Foursa do not teach the signal waveguide to be substantially free of rare earth elements. Libori teaches an optical waveguide substantially free of rare earth elements ([144]). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the waveguide device of Waarts and Foursa with the rare earth element free guide of Libori to utilized the high index offset of the germanium core to better contain the signal wave during propagation down the guide.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Waarts in view of Fermann et al. (USPGPUB 2003/0202547).

With respect to claim 15, Waarts teaches the waveguide device as described in the rejection to claim 1. Waarts does not teach the pump waveguide to have a cross-sectional area relative to that of the signal waveguide to be sufficiently small to suppress higher order inelastic scattering with a ratio of approximately 4-8. Fermann '547 teaches a waveguide with a ratio of inner to outer guides to be of 7.5 ([0119]). It would have been obvious at the time of the invention to combine the waveguide device with the inner to outer guide ratio of Fermann '547 to allow for a larger pump guide area to increase the energy storage potential ('547, [0010]).

Claims 20 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Waarts in view of Zanoni et al. (US 5991070).

With respect to claim 20, Waarts teaches the waveguide device as described in the rejection to claim 18 above, Waarts does not teach the structure to be arranged in a ring to feed back at least a portion of the signal beam for seeding. Zanoni teaches a waveguide device to be arranged in a ring for feedback of the signal beam (fig.5). It would have been obvious to one of ordinary skill at the time of the invention to combine the waveguide device of Waarts with the ring structure of Zanoni to redirect the amplified signal back through the amplifier fiber where it can be further amplified (Zanoni, col.7 lines 42-45).

Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Waarts in view of Fermann et al. (US 5880877).

With respect to claim 30, Waarts teaches the waveguide device as described in the rejection to claim 1. Waarts does not teach the gain medium to be sufficiently small to suppress higher order inelastic scattering. Fermann '877 teaches the use of shorter fiber lengths to avoid higher-order non-linear effects (col.3 lines 38-44). It would have been obvious to one of ordinary skill at the time of the invention to combine the waveguide device of Waarts with the short fiber span of Fermann '877 to avoid a loss of pulse energy in the fiber ('877, col.3 lines 41-44).

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tod T. Van Roy whose telephone number is (571)272-8447. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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Application/Control Number: 10/619,947  
Art Unit: 2828

Page 14